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- (54) **EXTENDABLE CABLE ENCLOSURE**
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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 302 days.

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H05K 7/14 (2006.01)

(52) **U.S. Cl.**
CPC **H05K 7/1491** (2013.01)

(58) **Field of Classification Search**
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USPC 312/290
See application file for complete search history.

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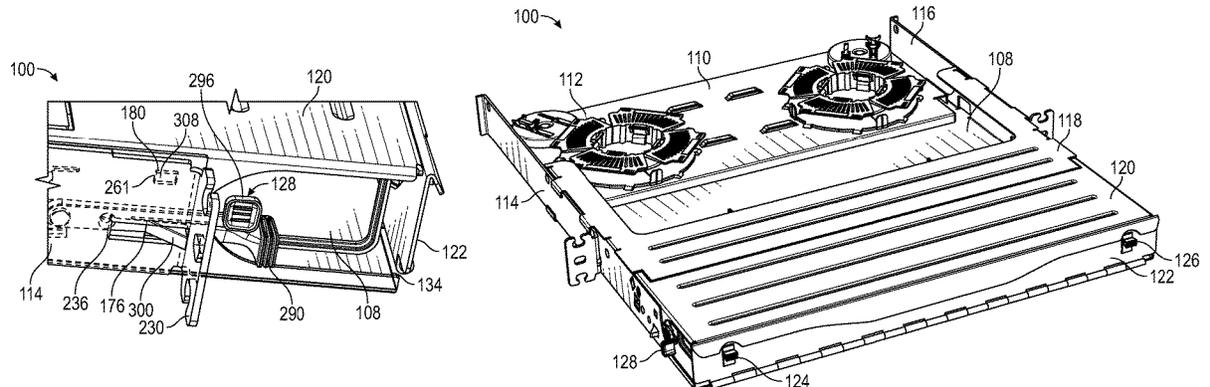
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(57) **ABSTRACT**

An example cable enclosure is provided that includes a chassis, a front cover coupled to the chassis, and first and second slide rails slidably coupled relative to the chassis. The cable enclosure includes a first release lever mounted to the chassis. The first release lever is capable of being positioned into a first position and a second position. In the first position, the first release lever engages the chassis to prevent sliding of the chassis and the front cover relative to the first and second slide rails. In the second position, the first release lever disengages the chassis to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

22 Claims, 8 Drawing Sheets



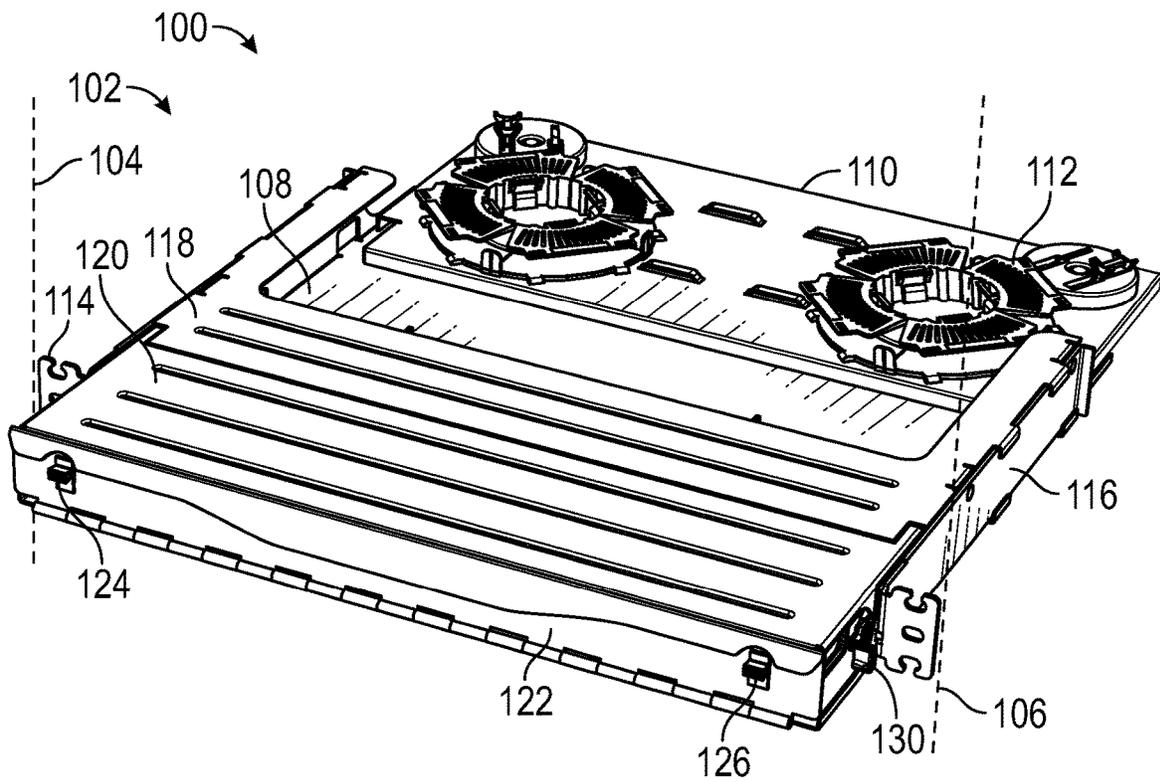
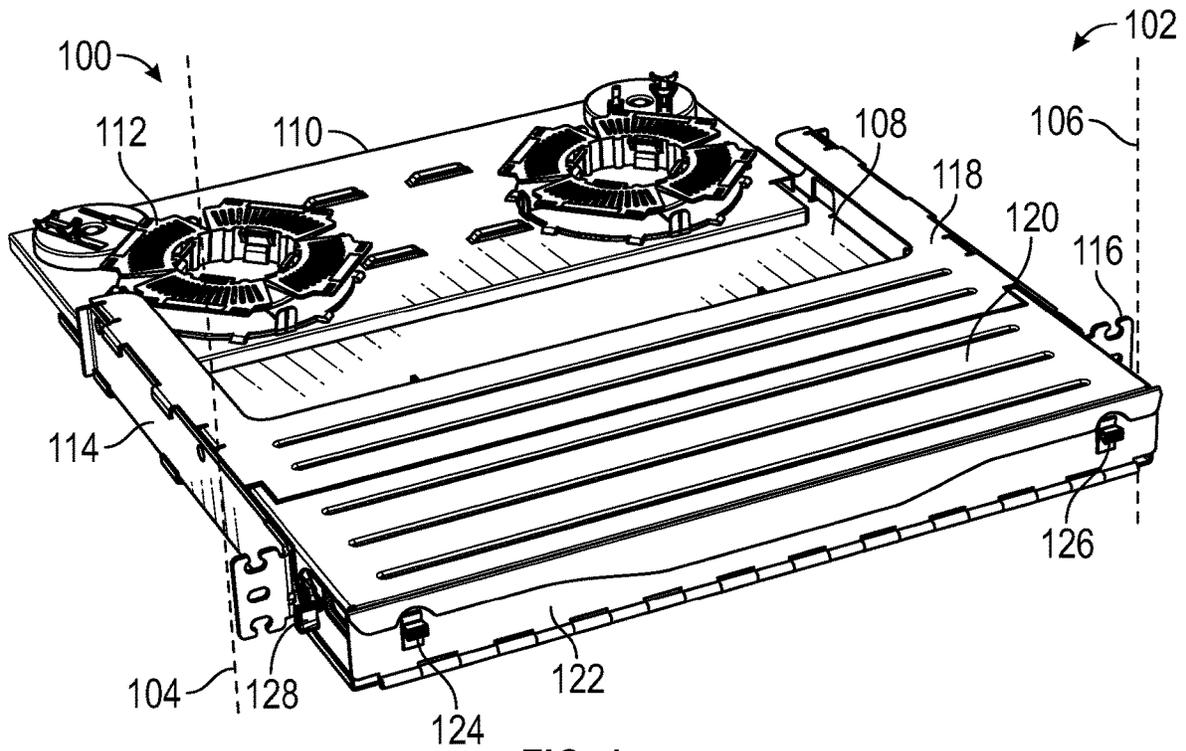
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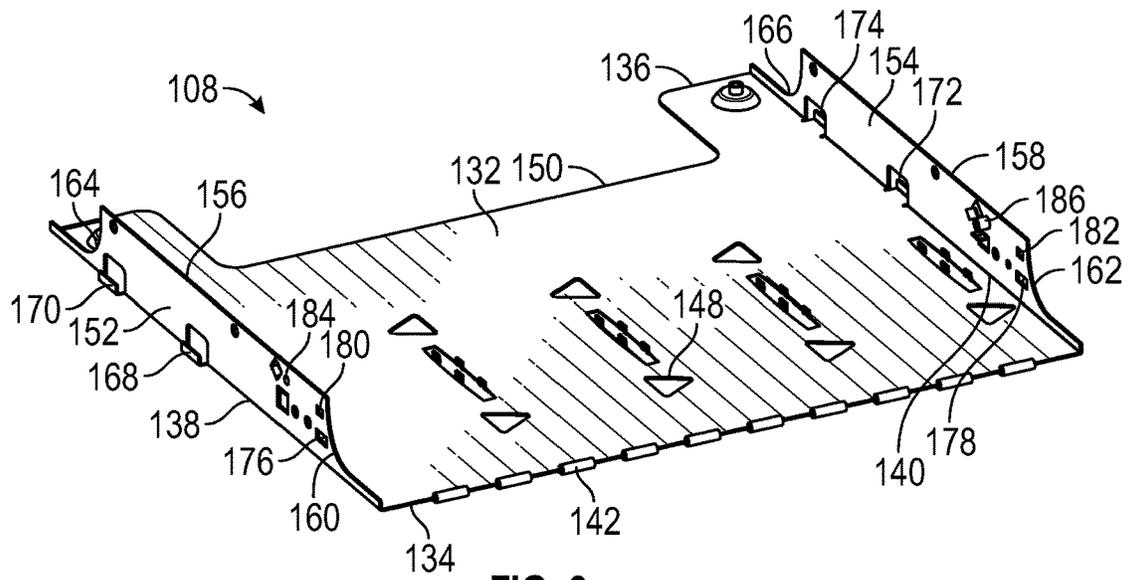


FIG. 3

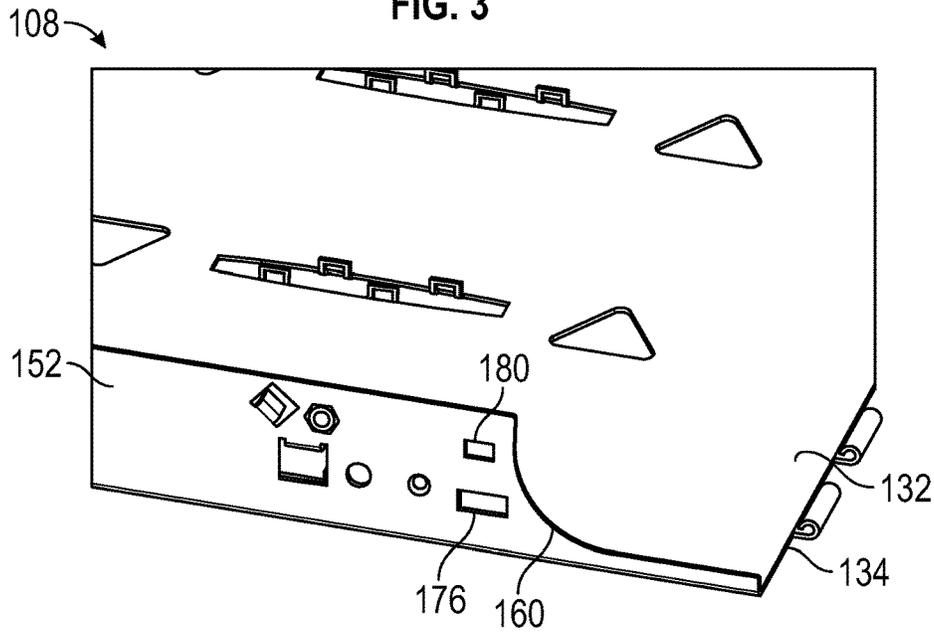


FIG. 4

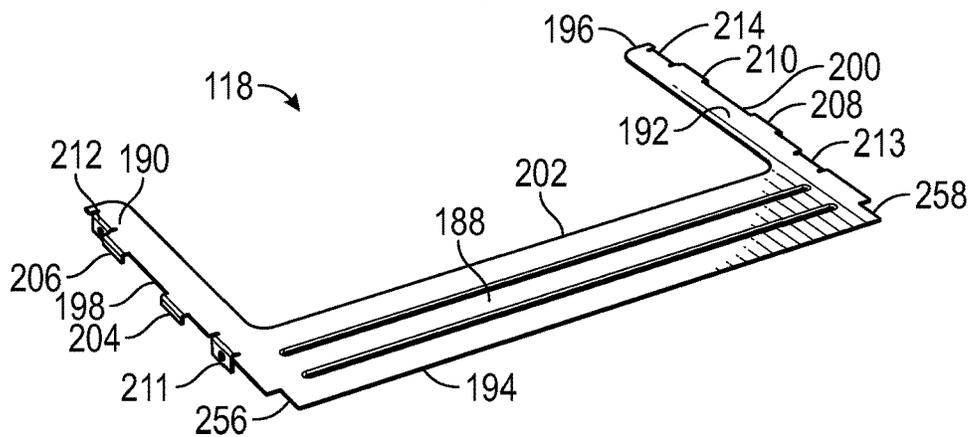


FIG. 5

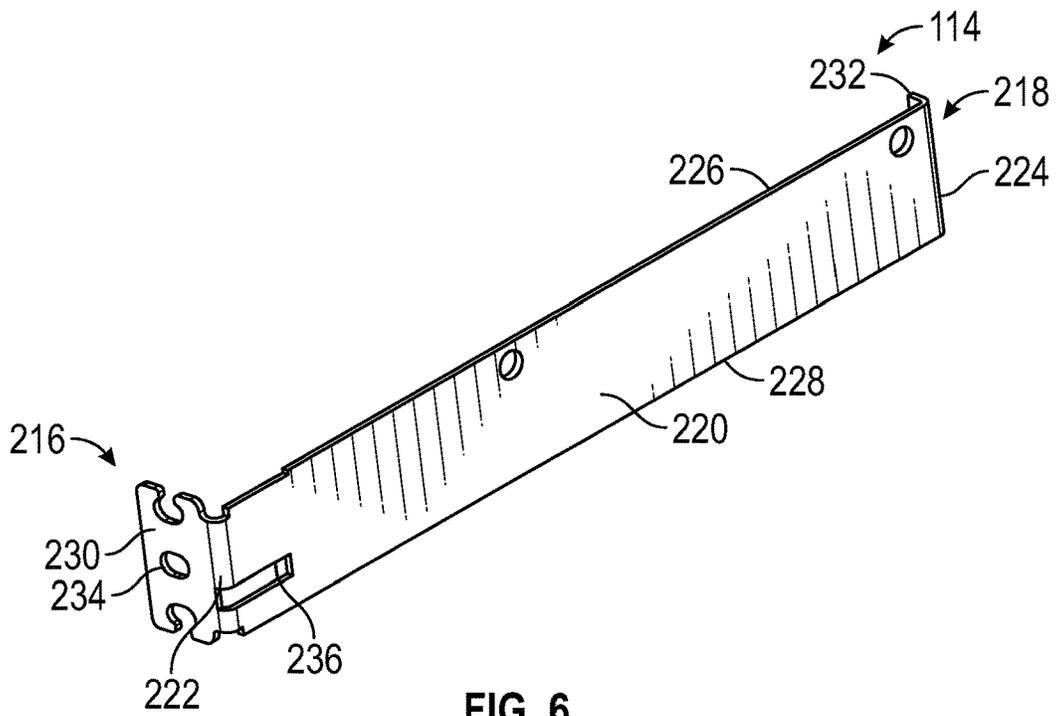


FIG. 6

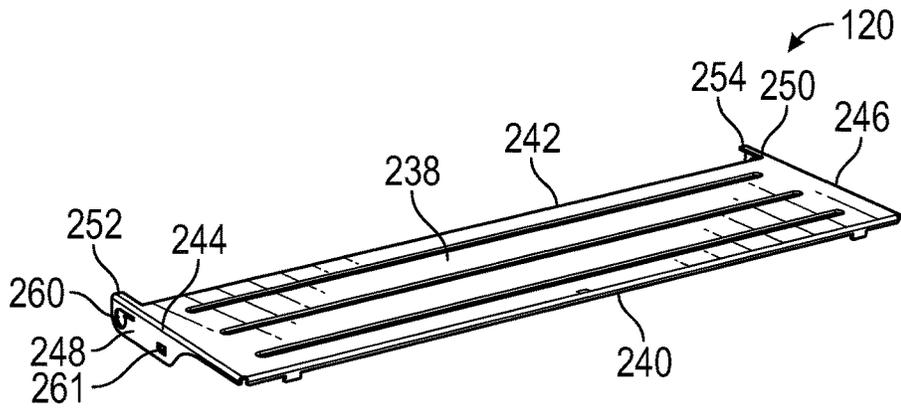


FIG. 7

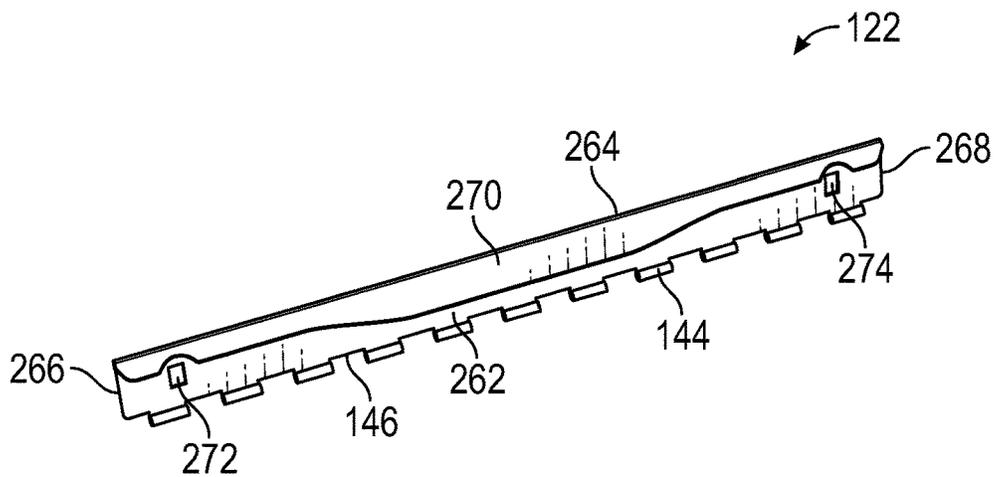


FIG. 8

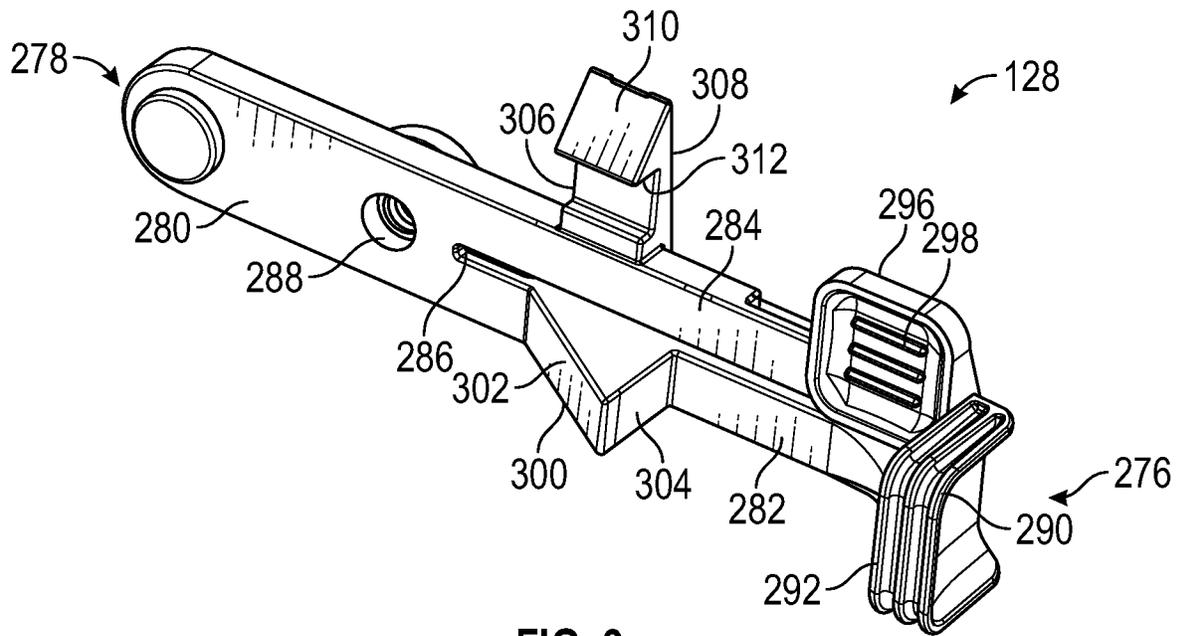


FIG. 9

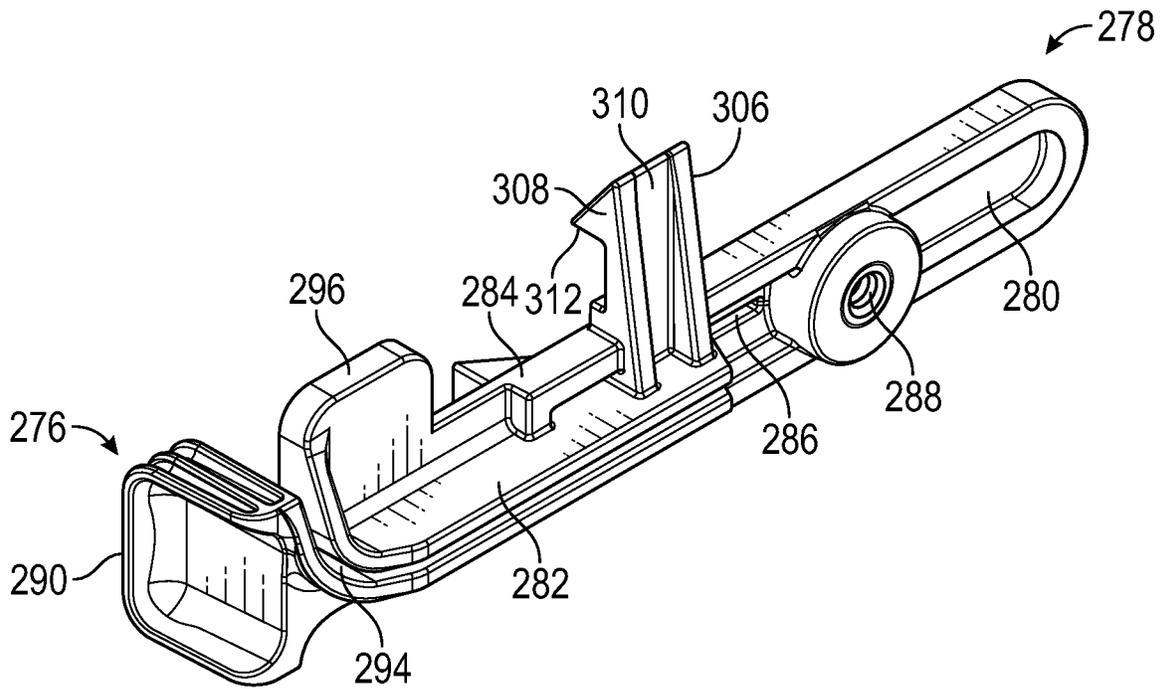


FIG. 10

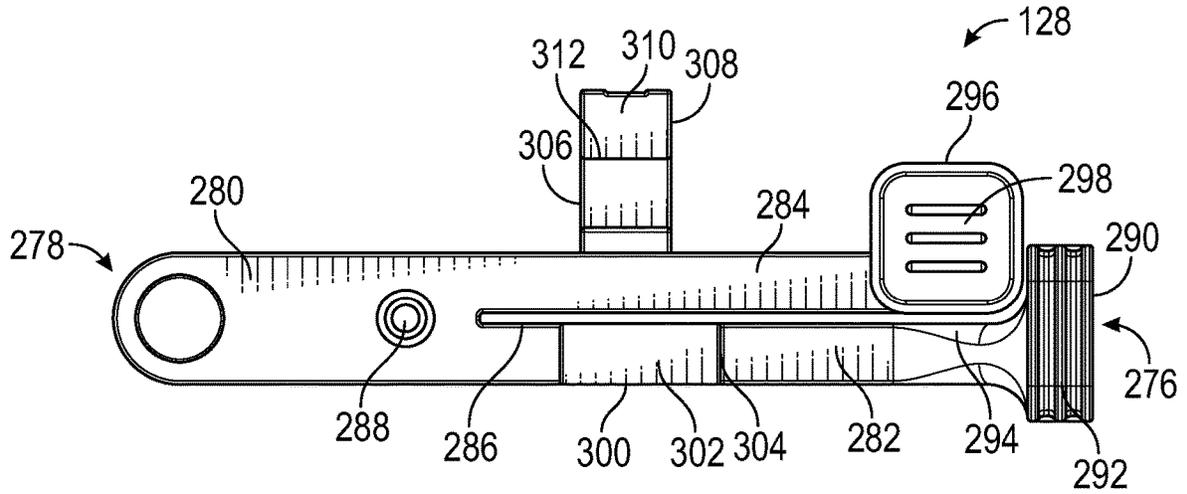


FIG. 11

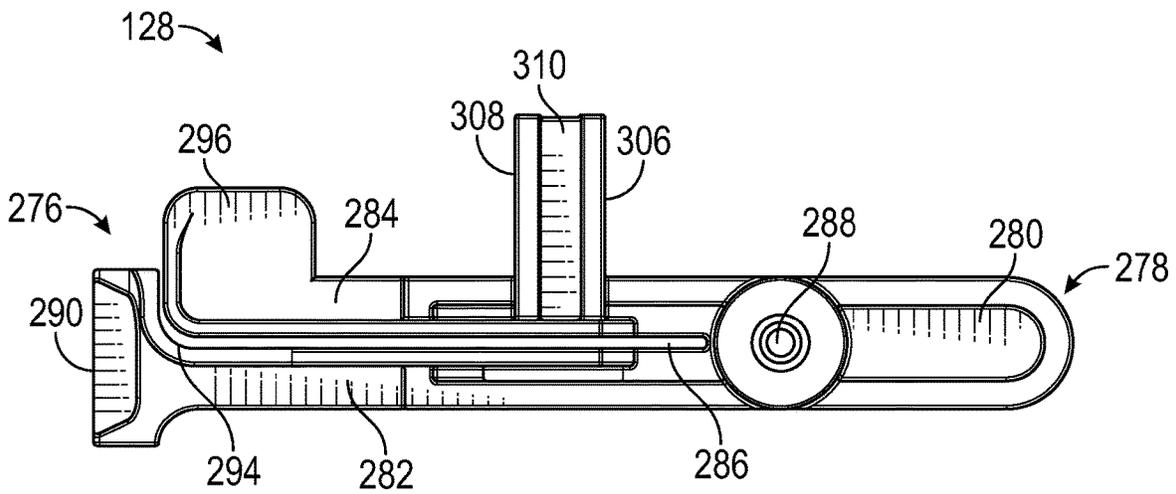


FIG. 12

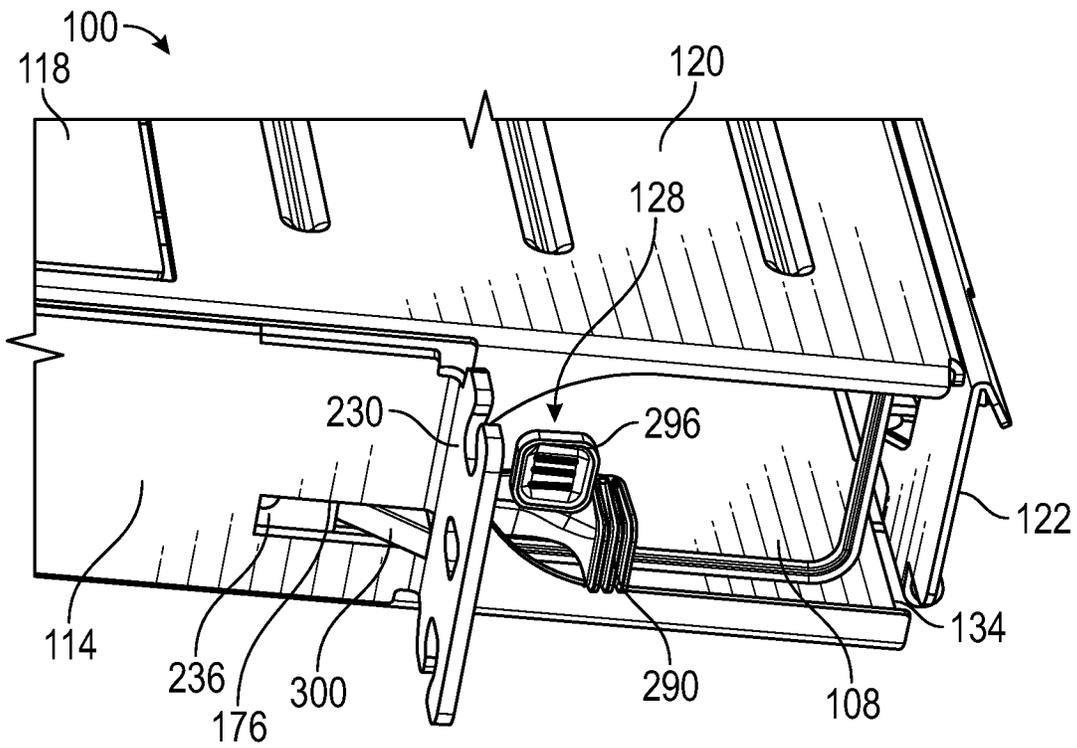


FIG. 13

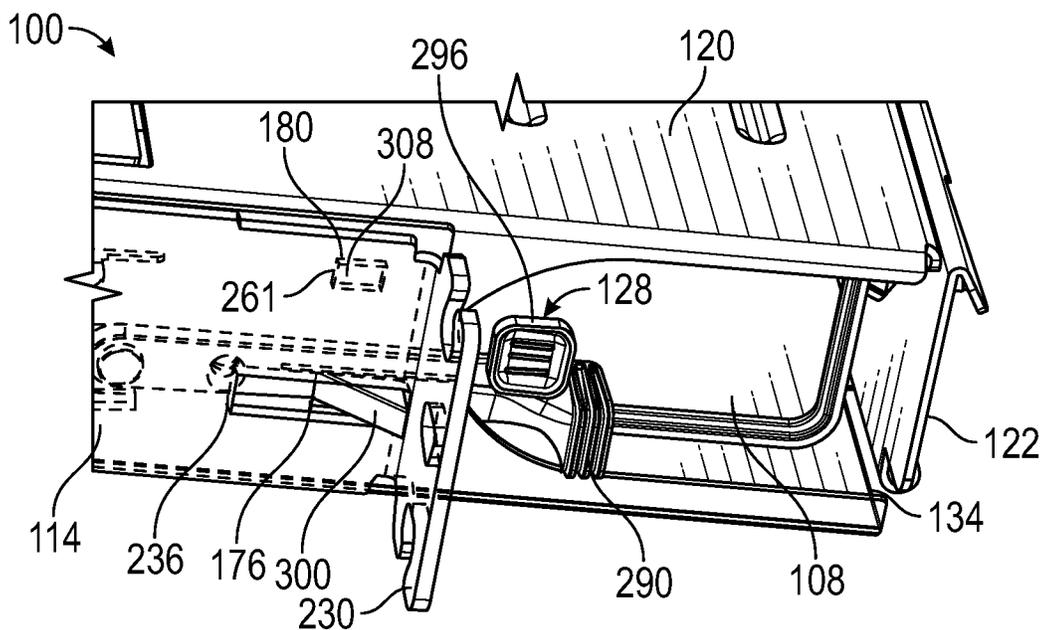


FIG. 14

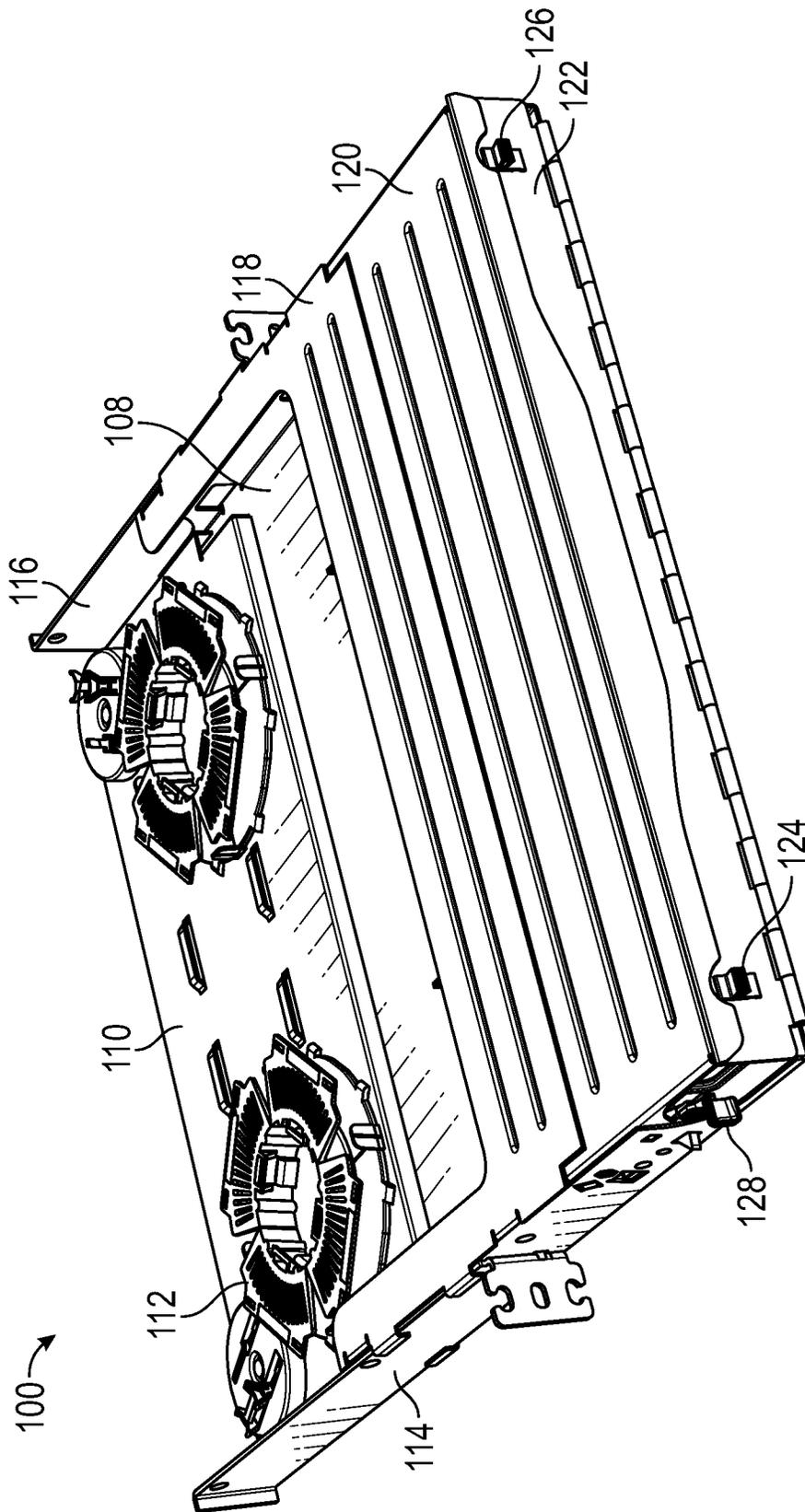


FIG. 15

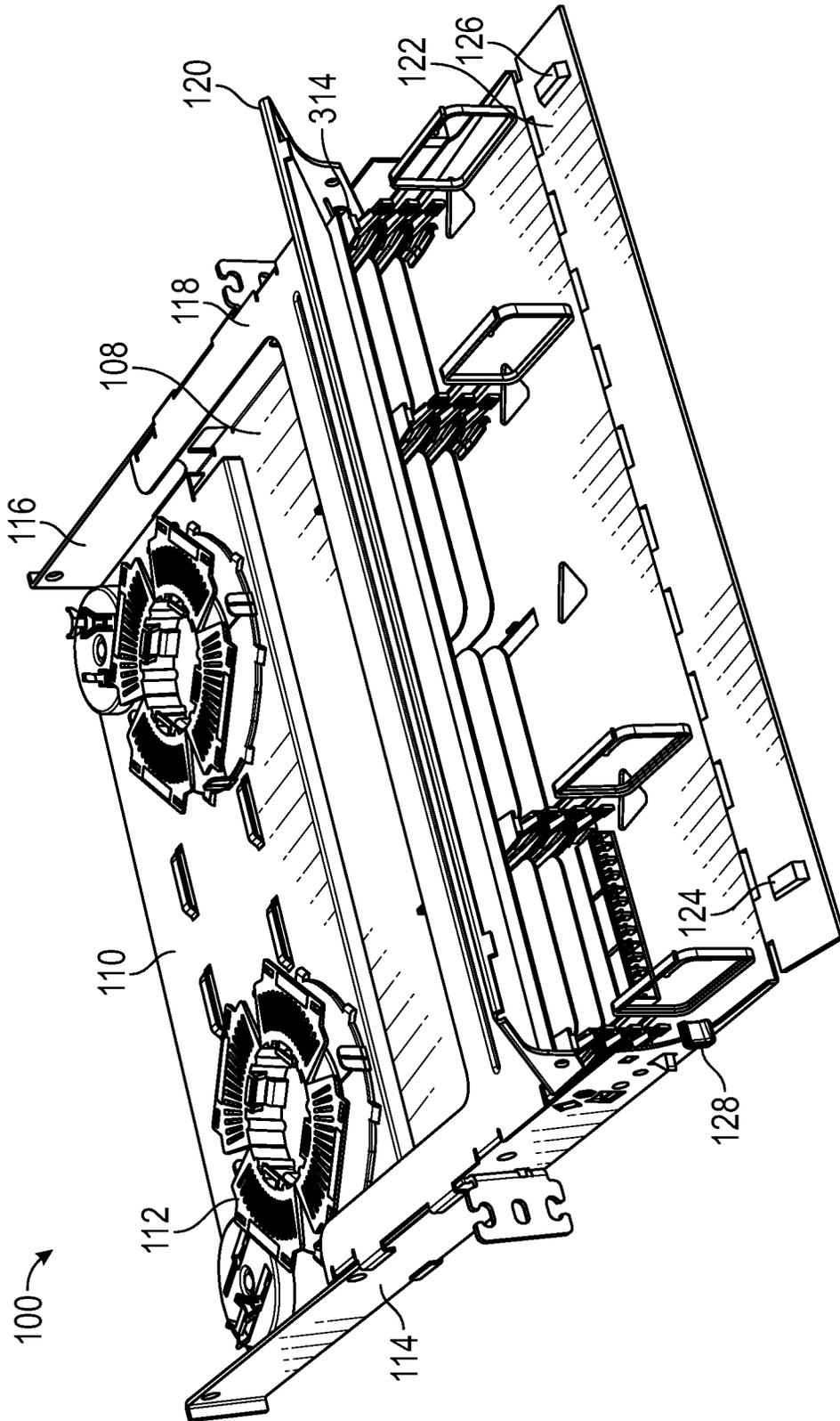


FIG. 16

EXTENDABLE CABLE ENCLOSURE

BACKGROUND

Datacenters generally include racks with standardized 1U, 2U and 4U spaces configured to receive enclosures of corresponding sizes. Traditional enclosures for cables, such as fiber optic cables, can include a door at the front surface that can be opened and closed to provide hand access to the interior of the enclosure. However, such hand access is limited to the height of the enclosure. For example, a 1U enclosure provides an opening having a height of about 1.75 inches through which cables can be accessed by the user after the front door has been opened.

In some instances, enclosures can include one or more inner trays capable of partially sliding out of the enclosure to provide additional access to the cables within the enclosure, particularly as cable density in enclosures increases. However, the inner trays and numerous connection points within the enclosure can result in additional pinch points that can damage cables, and even slightly injure the user's fingers. Sliding inner trays also increase the number of moving parts associated with the enclosure assembly, potentially increasing maintenance and/or manufacturing costs. In addition, sliding trays generally necessitate slack in the stored cable to allow for extension of the inner tray relative to the enclosure.

SUMMARY

Embodiments of the present disclosure provide an exemplary cable enclosure includes one or more release levers that allow for selective sliding or retraction of the enclosure relative to lateral slide rails. The release levers further allow for selective opening and closing of the front cover relative to the chassis. The exemplary cable enclosure provides a larger opening at the front or proximal end of the enclosure for more convenient access to the interior of the enclosure. The release levers allow for the entire enclosure to be extended from a rack to which the slide rails are mounted, providing for additional access for cable management.

In accordance with embodiments of the present disclosure, an exemplary cable enclosure is provided. The cable enclosure includes a chassis, a front cover coupled to the chassis, and first and second slide rails slidably coupled relative to the chassis. The cable enclosure includes a first release lever mounted to the chassis. The first release lever is capable of being positioned into a first position and a second position. In the first position, the first release lever engages the chassis to prevent sliding of the chassis and the front cover relative to the first and second slide rails. In the second position, the first release lever disengages the chassis to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

The chassis can be configured to support one or more spools for cable management or storage. The first and second slide rails can include a body with a mounting flange at a proximal end of the body. The mounting flange is configured to be secured to supports (e.g., vertical rails) associated with a rack. The cable enclosure can include a rear cover and a front door coupled to the chassis. Disengagement of the first release lever from the chassis allows for sliding of the chassis, the front cover, the rear cover, and the front door relative to the first and second slide rails.

The first release lever can include a body, a first cantilever extension extending from the body, and a second cantilever extension extending from the body. The first cantilever

extension can include a first engagement tab configured to engage with a slot formed in the first slide rail. In the first position, the first engagement tab extends through the slot of the first slide rail and abuts a proximal mounting flange of the first slide rail to prevent sliding of the chassis and the front cover relative to the first and second slide rails. In the second position, the first engagement tab is retracted from the slot of the first slide rail to provide clearance between the first engagement tab and the first slide rail, allowing for sliding of the chassis and the front cover relative to the first and second slide rails.

The second cantilever extension can include a second engagement tab configured to engage with a slot formed in the front cover. The second cantilever can be positionable in a third position and a fourth position. In the third position, the second engagement tab extends through the slot of the front cover to prevent pivoting of the front cover relative to the chassis into an open position. In the fourth position, the second engagement tab is retracted from the slot of the front cover to allow for pivoting of the front cover relative to the chassis into an open position. The cable enclosure can include a spring associated with the front cover. The spring biases the front cover into the open position upon disengagement of the second engagement tab from the slot of the front cover.

The first and second cantilever extensions of the first release lever are independently actuated relative to each other. The first cantilever extension can connect to the body at a distal end of the first cantilever extension, and can include a flange at a proximal end of the first cantilever extension. The flange can extend perpendicularly from the proximal end of the first cantilever extension. The cable enclosure can include second release lever disposed on an opposing side of the chassis from the first release lever. The first release lever can engage and disengage relative to the first slide rail, and the second release lever can engage and disengage relative to the second slide rail.

In accordance with embodiments of the present disclosure, an exemplary method of cable management is provided. The method includes providing a cable enclosure. The cable enclosure includes a chassis, a front cover coupled to the chassis, first and second slide rails slidably coupled relative to the chassis, and a first release lever mounted to the chassis. The method includes positioning the first release lever into a first position to engage the first release lever with the chassis and prevent sliding of the chassis and the front cover relative to the first and second slide rails. The method includes positioning the first release lever into a second position to disengage the first release lever from the chassis to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

The first release lever can include a body, a first cantilever extension extending from the body, and a second cantilever extension extending from the body. Positioning the first release lever into the first position can include extending a first engagement tab of the first cantilever extension through a slot of the first slide rail and abutting the first engagement tab against a proximal mounting flange of the first slide rail to prevent sliding of the chassis and the front cover relative to the first and second slide rails. Positioning the first release lever into the second position can include retracting the first engagement tab from the slot of the first slide rail to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

The method can include positioning the second cantilever extension into a third position to insert a second engagement tab of the second cantilever extension through a slot formed

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in the front cover to prevent pivoting of the front cover relative to the chassis into an open position. The method can include positioning the second cantilever extension into a fourth position to retract the second engagement tab from the slot of the front cover to allow for pivoting of the front cover relative to the chassis into the open position.

In accordance with embodiments of the present disclosure, an exemplary cable enclosure system is provided. The system includes a rack including a first support structure and a second support structure, and a cable enclosure mounted to the rack. The cable enclosure includes a chassis, a front cover coupled to the chassis, and first and second slide rails slidably coupled relative to the chassis. The first slide rail can be fixedly coupled to the first support structure of the rack and the second slide rail can be fixedly coupled to the second support structure of the rack. The cable enclosure includes a first release lever mounted to the chassis. The first release lever is capable of being positioned into a first position and a second position. In the first position, the first release lever engages the chassis to prevent sliding of the chassis and the front cover relative to the first and second slide rails. In the second position, the first release lever disengages the chassis to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

Any combination and/or permutation of embodiments is envisioned. Other objects and features will become apparent from the following detailed description considered in conjunction with the accompanying drawings. It is to be understood, however, that the drawings are designed as an illustration only and not as a definition of the limits of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

To assist those of skill in the art in making and using the extendable cable enclosure, reference is made to the accompanying figures, wherein:

FIG. 1 is a left perspective view of an extendable cable enclosure in an exemplary embodiment;

FIG. 2 is a right perspective view of the extendable cable enclosure of FIG. 1;

FIG. 3 is a left perspective view of a chassis of the extendable cable enclosure of FIG. 1;

FIG. 4 is a detailed view of the chassis of FIG. 3;

FIG. 5 is a left perspective view of a rear cover of the extendable cable enclosure of FIG. 1;

FIG. 6 is a perspective view of a slide rail of the extendable cable enclosure of FIG. 1;

FIG. 7 is a left perspective view of a front cover of the extendable cable enclosure of FIG. 1;

FIG. 8 is a left perspective view of a front door of the extendable cable enclosure of FIG. 1;

FIG. 9 is a left perspective view of a release lever of the extendable cable enclosure of FIG. 1;

FIG. 10 is a right perspective view of the release lever of FIG. 9;

FIG. 11 is a right side view of the release lever of FIG. 9;

FIG. 12 is a left side view of the release lever of FIG. 9;

FIG. 13 is a detailed view of the extendable cable enclosure of FIG. 1, including the release lever engaged with the slide rail;

FIG. 14 is a detailed view of the extendable cable enclosure of FIG. 1, including the release lever engaged with an opening of the chassis;

FIG. 15 is a left perspective view of the extendable cable enclosure of FIG. 1 in an extended position relative to the slide rails; and

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FIG. 16 is a left perspective view of the extendable cable enclosure of FIG. 1 in an extended position relative to the slide rails, and including the front cover and front door in open positions.

DETAILED DESCRIPTION

FIGS. 1 and 2 are perspective views of an exemplary extendable cable enclosure 100 (hereinafter “enclosure 100”) of the present disclosure. The enclosure 100 is configured and dimensioned to fit within an opening between vertical rails 104, 106 (e.g., supports) of a housing or rack 102, and further be secured or mounted to the rails 104, 106. Although shown as a 1U size enclosure 100, it should be understood that the enclosure 100 can be of any size used in the industry, e.g., 1U, 2U, 4U, or the like.

The enclosure 100 can include a chassis 108 that supports a platform 110 capable of engaging one or more cable spools 112. The enclosure 100 can include first and second slide rails 114, 116, a rear cover 118, a front cover 120, and a front door 122. The slide rails 114, 116 can be mounted to the rails 104, 106 of the rack 102 to maintain the enclosure 100 secured to the rack 102. The assembly of the chassis 108, platform 110, rear cover 118, front cover 120 and front door 122 is slidably engaged with the slide rails 114, 116 to slide in and out of the rack 102 and relative to the slide rails 114, 116. Latches 124, 126 can be disengaged to independently swing open the front door 122 to access the interior of the enclosure 100 only through the front door 122.

As will be discussed in greater detail below, cantilever flanges of release levers 128, 130 (e.g., release mechanisms) positioned on either side of the chassis 108 can be selectively depressed to disengage the assembly from the slide rails 114, 116 to slide the assembly out of the rack 102, to disengage and swing open the front cover 120, or both. The release levers 128, 130 therefore allow for extension of the assembly out of the rack 102, and for opening of the front cover 120 to provide greater access into the interior of the enclosure 100. For example, in a 1U size enclosure 100, rather than the about 1.75 inch space for access, the enclosure 100 can provide about 5 inches of space for access.

With reference to FIGS. 3 and 4, a perspective and detailed views of the chassis 108 are provided. The chassis 108 includes a body or base 132 defining a substantially planar or flat configuration. The base 132 includes a front edge 134, a rear edge 136, and side or lateral edges 138, 140. The front edge 134 includes spaced knuckles 142 that are assembled with corresponding knuckles 144 extending from a bottom edge 146 of the front door 122 (see FIG. 8) to form a hinge along which the front door 122 can pivot to open and close access to the interior of the enclosure 100. The base 132 can include openings 148 formed therein to receive and engage with features for organizing patching equipment and/or cables within the enclosure 100. In some embodiments, a U-shaped cutout 150 can be formed at the rear edge 136.

The chassis 108 includes side walls 152, 154 extending substantially perpendicularly from respective lateral edges 138, 140. The side walls 152, 154 can define substantially flat or planar configurations. Each side wall 152, 154 includes a top edge 156, 158, a leading or front edge 160, 162, and a trailing or rear edge 164, 166. In some embodiments, the front and/or rear edges 160-166 can define a rounded taper towards the respective front and rear edges 134, 136 of the chassis 108. The chassis 108 includes two flanges 168-174 extending outwardly from the edges 138, 140 and side walls 152, 154. The flanges 168-174 can be

formed from a portion of the side walls **152, 154**, thereby leaving an opening in the side walls **152, 154** adjacent to the flanges **168-174**. Each flange **168-174** can curve upwardly to define a passage or slot capable of receiving a bottom edge of the slide rails **114, 116**.

Adjacent to the front edges **160, 162**, each side wall **152, 154** includes a first opening or slot **176, 178** formed therein, and a second opening or slot **180, 182** formed therein. The first slot **176, 178** can be positioned closer to the edge **138, 140**, and the second slot **180, 182** can be positioned closer to the top edge **156, 158**. Both slots **176-182** can define a substantially rectangular configuration. However, the slot **176, 178** is dimensioned longer than the slot **180, 182**, extending further towards the rear edge **164, 166** than the slot **180, 182**. Holes **184, 186** formed in the side walls **152, 154** can receive pins and/or fasteners to form a pivot point for the front cover **120**.

With reference to FIG. 5, a perspective view of the rear cover **118** is provided. The rear cover **118** includes a central section **188** and lateral sections **190, 192** defining a substantially planar configuration. For example, the central and lateral sections **188-192** can extend along the same plane. The rear cover **118** includes a front edge **194**, a rear edge **196**, and lateral or side edges **198, 200**. The rear cover **118** can include a U-shaped cutout **202** formed at the rear edge **196** and extending towards the front edge **194**, resulting in a substantially U-shaped configuration of the rear cover **118**. The rear cover **118** includes at least two flanges **204-206, 208, 210** extending substantially perpendicularly and downwardly from the side edges **198, 200**. Each flange **204-210** can at least partially curve away from the edge **198, 200**, thereby defining a slot or passage configured to receive a top edge of the respective side rails **114, 116** (and the top edges **156, 158** of the chassis **108**). The rear cover **118** includes fixation flanges **211, 212, 213, 214** extending downwardly from the side edges **198, 200**, each flange **211-214** including an opening for securing the rear cover **118** to side walls **152, 154** of the chassis **108**.

With reference to FIG. 6, a perspective view of the side rail **114** is provided. It should be understood that the side rail **116** includes the same components as the side rail **114** and is a mirror image thereof. The side rail **114** includes a front or proximal end **216** and a rear or distal end **218**. The side rail **114** includes a body **220** defining a substantially planar configuration extending between the proximal and distal ends **216, 218**. The body **220** includes a front edge **222**, a rear edge **224**, a top edge **226**, and a bottom edge **228**. The side rail **114** includes a front flange **230** (e.g., mounting flange) extending perpendicularly from the front edge **222**, and a rear flange **232** extending perpendicularly from the rear edge **224**. The front and rear flanges **230, 232** extend in the same direction from the body **220**, and extend substantially parallel relative to each other.

The flange **230** defines a lateral length or width dimensioned greater than the lateral length or width of the flange **232**. The flange **230** includes one or more openings **234** formed therein. The openings **234** in the side rails **114, 116** can be used to fasten the enclosure **100** to the respective rails **104, 106** of the rack **102** (see, e.g., FIG. 1). The side rail **114** includes an elongated slot **236** formed in the body **220** and extending from the edge **222** towards the edge **224**. The length of the slot **236** can be longer than the slot **176** formed in the chassis **108**. After assembly, the front or proximal edge of the slots **236** of the side rails **114, 116** can substantially align with the front or proximal edge of the slots **176,**

178 of the chassis **108**. The side rails **114, 116** do not include slots or openings corresponding with the slots **180, 182** of the chassis **108**.

With reference to FIG. 7, a perspective view of the front cover **120** is provided. The front cover **120** includes a central section **238** with a front edge **240**, a rear edge **242**, and lateral or side edges **244, 246**. The central section **238** defines a substantially planar or flat configuration. The front cover **120** includes side flanges **248, 250** extending substantially perpendicularly and downwardly from the respective side edges **244, 246**. In some embodiments, the rear ends **252, 254** of the flanges **248, 250** can extend beyond the rear edge **242** of the central section **238**. In such embodiments, the corners of the front edge of the rear cover **118** can include cutouts **256, 258** complementary to the rear ends **252, 254** such that when assembled, the cutouts **256, 258** at least partially receive the rear ends **252, 254** (see, e.g., FIG. 1). Each flange **248, 250** includes an opening **260** formed therein (not visible in flange **250**). When assembled, the openings **260** align with openings **184, 186** of the chassis **108** to create the pivot point of the front cover **120** relative to the chassis **108**. Each flange **248, 250** includes a slot **261** formed near or at the proximal end of the flange **248, 250** (not visible for flange **250**).

With reference to FIG. 8, a perspective view of the front door **122** is provided. The front door **122** includes a central section or body **262** defining a substantially planar or flat configuration. The front door **122** includes a top edge **264**, the bottom edge **146**, and lateral or side edges **266, 268**. In some embodiments, the front door **122** can include a lip **270** extending downwardly therefrom. The lip **270** can function as a handle for opening and closing the front door **122**. The body **262** includes slots **272, 274** that receive the respective latches **124, 126**. The knuckles **144** of the front door **122** align with the knuckles **140** of the chassis **108** to create a pivot axis for the front door **122** relative to the chassis **108**.

With reference to FIGS. 9-12, perspective and side views of the release lever **128** are provided. It should be understood that the release lever **130** is substantially similar in structure and function to the release lever **128**, and is a mirror image thereof. The release lever **128** includes a proximal end **276** and an opposing distal end **278**. The release lever **128** includes a substantially solid body **280** at the distal end **278**, and two cantilever extensions **282, 284** (e.g., bottom and top flanges) extending from the body **280**. The extensions **282, 284** can be substantially aligned with the body **280** along the same plane. The extensions **282, 284** are separated from each other by a gap **286** such that the distal end of the extensions **282, 284** is connected to the body **280** and the proximal end of the extensions **282, 284** is free to be pivoted. The material of the release lever **128** (e.g., plastic, or the like) can provide sufficient rigidity for maintaining the structural configuration of the release lever **128**, while allowing the extensions **282, 284** to be independently flexed or pivoted by the user.

The release lever **128** includes a hole **288** formed in the body **280** for securing the release lever **128** to the chassis **108**. The cantilever extension **282** includes a grip or flange **290** extending substantially perpendicularly from the proximal end of the extension **282**. The flange **290** can include ergonomic features **292** (e.g., ribs, texture, ridges, or the like) to provide a gripping surface to the user. The perpendicular orientation of the flange **290** relative to the extension **282** further provides a gripping edge to the user to, e.g., pull on the release lever **128** during operation of the enclosure **100**. A top surface of the extension **282** can include a curved section **294** adjacent to the flange **290**.

The cantilever extension **284** includes a grip or flange **296** extending from the proximal end of the extension **284**. The flange **296** can include ergonomic features **298** (e.g., ribs, texture, ridges, or the like) to provide a gripping surface to the user. The ergonomic features **292, 298** of the flanges **290, 296** can assist the user in locating the flanges **292, 296** during use of the enclosure **100** without necessarily seeing the flanges **292, 296** (e.g., if cables or additional components block the user's view of the flanges **292, 296**). A bottom edge of the flange **296** can be curved to substantially fit within the curved section **294** of the extension **282**. The length of the extension **284** is therefore dimensioned shorter than the length of the extension **282**.

The extension **282** includes an engagement tab **300** (e.g., a snap feature) extending substantially perpendicularly from the extension **282**. The engagement tab **300** extends in the same direction as the flange **290**. The engagement tab **300** can define a substantially triangular cross-section, including a tapered surface **302** extending away from the extension **282**, and a flat engagement surface **304**. As will be discussed in greater detail below, the engagement tab **300** is configured to at least partially extend through the slot **176** of the chassis **108** and the slot **236** of the slide rail **114**, with the engagement surface **304** abutting the flat surface of the flange **230** to prevent extension of the enclosure **100** (except for the side rails **114, 116**) out of the rack **102** (see, e.g., FIGS. **1, 13** and **14**).

The extension **284** includes a perpendicular protrusion **306** extending vertically from the extension **284** between the body **280** and the flange **296**. The protrusion **306** includes an engagement tab **308** (e.g., a snap feature) extending perpendicularly from the protrusion **306** in the same direction as the engagement tab **300**. The engagement tab **308** includes a tapered surface **310** extending from the top edge of the tab **308**, and a flat engagement surface **312**. As will be discussed in greater detail below, the engagement tab is configured to extend through the slot **180** of the chassis **108** and at least partially into slot **261** of the front cover **120**, with the engagement surface **312** abutting a flat edge of the slot **261** to prevent opening of the front cover **120** (see, e.g., FIGS. **1, 14** and **15**).

During assembly of the enclosure **100**, the platform **110** can be mounted to the chassis **108**, and the rear cover **118**, front cover **120** and front door **122** can be secured to the chassis **108**. The front door **122** is secured to the chassis **108** such that disengagement of the latches **124, 126** allows for the front door **122** to pivot into an open position at the pivot axis formed by the knuckles **140, 144**. The front cover **120** is secured to the chassis **108** at pivot points associated with holes **260** in the front cover **120**, allowing the front cover **120** to pivot upwardly and away from the base **132** of the chassis **108** to provide additional access to the interior of the enclosure **100** (see, e.g., FIG. **16**). The assembly includes springs **314** (e.g., torsion springs) at or near each of the pivot points for the front cover **120** (see FIG. **16**). The springs **314** bias the front cover **120** into the open position. As such, when the front cover **120** is released from the locked and closed position, the spring-loaded front cover **120** is biased by the springs **314** into the fully open position shown in FIG. **16**.

The release levers **128, 130** can be secured to the chassis **108**. The slide rails **114, 116** can be assembled with the chassis **108** and rear cover **118**, as shown in FIGS. **1-2** and **15-16**. In particular, the chassis **108** and rear cover **118** are assembled over the slide rails **114, 116**, such that the flanges of the chassis **108** and rear cover **118** are positioned over and around the top and bottom edges **226, 228** of the slide rails

114, 116. Such assembly maintains the slide rails **114, 116** secured to the remaining components of the enclosure **100**, while allowing the entire enclosure **100** to slide relative to the slide rails **114, 116**. It should be understood that when discussing sliding of the enclosure **100** relative to the rack **102**, use of the term "entire enclosure" or "enclosure" refers to all components of the enclosure **100** except for the slide rails **114, 116**, which remain fixed to the rails **104, 106**.

The slide rails **114, 116** are secured to the respective rails **104, 106** of the rack **102**, and the release levers **128, 130** are engaged or interlocked with the chassis **108** and the respective slide rails **114, 116**. FIGS. **13** and **14** show the enclosure **100** in the retracted position and with the front cover **120** in the closed position, with both release levers **128, 130** engaged or interlocked with the chassis **108** and slide rails **114, 116**. In the retracted and closed position, the engagement tab **300** extends through the slots **176, 236** in the chassis **108** and slide rail **114**, with the flat engagement surface **304** abutting the flange **230** of the slide rail **114**. Such engagement of the engagement tab **300** prevents the enclosure **100** from sliding outward relative to the slide rail **114**. The engagement tab **308** extends through the slot **180** of the chassis **108** and at least partially into slot **261** of the front cover **120** (behind slide rail **114**). Such engagement of the engagement tab **308** prevents the front cover **120** from pivoting upward into the open position. A similar engagement occurs on the right side of the enclosure **100** with slide rail **116**, front cover **120** and release lever **130**.

In operation, access to the interior of the enclosure **100** can be achieved in different ways or by using a combination of the options provided by the enclosure **100**. Latches **124, 126** can be disengaged to swing open the front door **122** without extending the enclosure **100** relative to the rack **102** and slide rails **114, 116**. If sufficient space is provided above the enclosure **100** in the rack **102**, the front cover **120** can be opened without extending the enclosure **100** relative to the rack **102** and slide rails **114, 116**. To open the front cover **120**, flanges **296** on both release levers **128, 130** can be pressed inwardly towards each other. Due to the cantilever arrangement of the extension **284**, inwardly pressing the flanges **296** disengages the engagement tab **308** from at least the slot **261** in the front cover **120** (and potentially the slot **180** of the chassis **108**). As the engagement tab **308** is removed from the slot **261**, the springs **314** bias the front cover **120** into the open position shown in FIG. **16**. In the open position and with the front door **122** open, the enclosure **100** provides significantly more hand access to the interior of the enclosure **100** as compared to traditional enclosures. Lowering the front cover **120** into the closed position (e.g., FIG. **1**) interlocks the engagement tab **308** with the slots **261** in the front cover **120** and prevents undesired opening of the front cover **120**.

If sliding out of the enclosure **100** relative to the rack **102** (and the slide rails **114, 116**) is desired, flanges **290** on both release levers **128, 130** can be pressed inwardly towards each other. Due to the cantilever arrangement of the extension **282**, inwardly pressing the flanges **290** disengages the engagement tabs **300** from at least the slot **236** in the side rails **114, 116** (and potentially the slots **176, 178** in the chassis **108**). Upon removal of the engagement tab **300** from the slots **236**, the flanges **290** can be used as a gripping surface to pull the enclosure **100** forward and out of the rack **102**. Sliding of the enclosure **100** as shown in FIGS. **15** and **16** provides clearance for the front cover **120** relative to the rack **102** space (if opening of the front cover **120** is desired). Flanges **204, 206** of the rear cover **118** act as stops or limits to restrict extension of the enclosure **100** beyond a prede-

terminated distance. FIGS. 15 and 16 show the enclosure 100 in the extended position. Sliding the enclosure 100 inwardly between the sliding rails 114, 116 results in interlocking of the engagement tabs 300 with the slots 236 to lock the enclosure 100 in the retracted position.

Although the enclosure 100 is shown with two release levers 128, 130, one on each side of the assembly, it should be understood that the enclosure 100 could include only a single release lever 128 (or release lever 130) while still providing the same functionality of the enclosure 100. However, two release levers 128, 130 can act as a safety mechanism to ensure movement of the enclosure 100 and/or opening of the front cover 120 is not accidentally activated. As described herein, operating the sliding function of the enclosure 100 and opening of the front cover 120 can be performed independently from each other, depending on the needs of the user. Specifically, the separated cantilever extensions 282, 284 of the release levers 128, 130 allow for independent operation of the release levers 128, 130.

For example, the front door 122 can be opened without affecting the position of the enclosure 100 or the front cover 120, the front cover 120 can be opened without sliding the enclosure 100 out of the rack 102, the enclosure 100 can be slid out of the rack 102 and only the front door 122 can be opened, and the enclosure 100 can be slid out of the rack 102 and the front door 122 and front cover 120 can be opened. The configuration and positioning of the cantilever extensions 282, 284 also allows the user to potentially actuate both extensions 282, 284 substantially simultaneously in a convenient and easy manner to both extend the enclosure 100 and open the front cover 120. The enclosure 100 thereby provides flexibility and greater access to the interior of the enclosure 100. The design of the enclosure 100 also allows for a shorter overall enclosure 100 length (providing more room for cabling), a lighter enclosure 100 weight (providing for easier installation), fewer assembly parts (resulting in lower cost), fewer pinch points for cables (due to better ergonomics), fixed distances between connection points (providing for simpler cable routing and/or less on-chassis slack requirements), combinations thereof, or the like.

While exemplary embodiments have been described herein, it is expressly noted that these embodiments should not be construed as limiting, but rather that additions and modifications to what is expressly described herein also are included within the scope of the invention. Moreover, it is to be understood that the features of the various embodiments described herein are not mutually exclusive and can exist in various combinations and permutations, even if such combinations or permutations are not made express herein, without departing from the spirit and scope of the invention.

The invention claimed is:

1. A cable enclosure, comprising:

- a chassis;
 - a front cover coupled to the chassis;
 - a first slide rail and a second slide rail slidably coupled relative to the chassis;
 - a first release lever mounted to the chassis, the first release lever is capable of being positioned into a first position and a second position; and
 - a rear cover and a front door coupled to the chassis;
- wherein in the first position, the first release lever engages the chassis to prevent sliding of the chassis and the front cover relative to the first and second slide rails;
- wherein in the second position, the first release lever disengages the chassis to allow for sliding of the chassis and the front cover relative to the first and second slide rails; and

wherein disengagement of the first release lever from the chassis allows for sliding of the chassis, the front cover, the rear cover, and the front door relative to the first and second slide rails.

2. The cable enclosure of claim 1, wherein the chassis is configured to support one or more spools for cable management or storage.

3. The cable enclosure of claim 1, wherein the first and second slide rails include a body with a mounting flange at a proximal end of the body, the mounting flange configured to be secured to supports associated with a rack.

4. The cable enclosure of claim 1, wherein the first release lever includes a body, a first cantilever extension extending from the body, and a second cantilever extension extending from the body.

5. The cable enclosure of claim 4, wherein the first cantilever extension includes a first engagement tab configured to engage with a slot formed in the first slide rail.

6. The cable enclosure of claim 5, wherein in the first position, the first engagement tab extends through the slot of the first slide rail and abuts a proximal mounting flange of the first slide rail to prevent sliding of the chassis and the front cover relative to the first and second slide rails.

7. The cable enclosure of claim 5, wherein in the second position, the first engagement tab is retracted from the slot of the first slide rail to provide clearance between the first engagement tab and the first slide rail, allowing for sliding of the chassis and the front cover relative to the first and second slide rails.

8. The cable enclosure of claim 4, wherein the second cantilever extension includes a second engagement tab configured to engage with a slot formed in the front cover, the second cantilever positionable in a third position and a fourth position.

9. The cable enclosure of claim 8, wherein in the third position, the second engagement tab extends through the slot of the front cover to prevent pivoting of the front cover relative to the chassis into an open position.

10. The cable enclosure of claim 8, wherein in the fourth position, the second engagement tab is retracted from the slot of the front cover to allow for pivoting of the front cover relative to the chassis into an open position.

11. The cable enclosure of claim 10, comprising a spring associated with the front cover, the spring biasing the front cover into the open position upon disengagement of the second engagement tab from the slot of the front cover.

12. The cable enclosure of claim 4, wherein the first and second cantilever extensions of the first release lever are independently actuated relative to each other.

13. The cable enclosure of claim 4, wherein the first cantilever extension connects to the body at a distal end of the first cantilever extension, and includes a flange at a proximal end of the first cantilever extension, the flange extending perpendicularly from the proximal end of the first cantilever extension.

14. The cable enclosure of claim 1, comprising a second release lever disposed on an opposing side of the chassis from the first release lever, wherein the first release lever engages and disengages relative to the first slide rail, and the second release lever engages and disengages relative to the second slide rail.

15. The cable enclosure of claim 1, wherein the first and second slide rails are mountable to a rack.

16. The cable enclosure of claim 1, wherein: the first and second slide rails are directly slidably coupled to the chassis;

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in the first position, the first release lever engages at least one of the first slide rail or the second slide rail to prevent sliding of the chassis and the front cover relative to the first and second slide rails; and in the second position, the first release lever disengages at least one of the first slide rail or the second slide rail to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

17. The cable enclosure of claim 1, wherein: the first release lever includes a tab;

in the first position, the tab of the first release lever passes through an opening of the chassis to engage with at least one of the first slide rail or the second slide rail to prevent sliding of the chassis and the front cover relative to the first and second slide rails; and

in the second position, the tab of the first release lever passes through the opening of the chassis to disengage with at least one of the first slide rail or the second slide rail to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

18. A method of cable management, comprising:

providing a cable enclosure, the cable enclosure including (i) a chassis, (ii) a front cover coupled to the chassis, (iii) a first slide rail and a second slide rail slidably coupled relative to the chassis, (iv) a first release lever mounted to the chassis, and (v) a rear cover and a front door coupled to the chassis;

positioning the first release lever into a first position to engage the first release lever with the chassis and prevent sliding of the chassis and the front cover relative to the first and second slide rails; and

positioning the first release lever into a second position to disengage the first release lever from the chassis to allow for sliding of the chassis and the front cover relative to the first and second slide rails;

wherein disengagement of the first release lever from the chassis allows for sliding of the chassis, the front cover, the rear cover, and the front door relative to the first and second slide rails.

19. The method of claim 18, wherein the first release lever includes a body, a first cantilever extension extending from the body, and a second cantilever extension extending from the body.

20. The method of claim 19, wherein:

positioning the first release lever into the first position comprises extending a first engagement tab of the first cantilever extension through a slot of the first slide rail and abutting the first engagement tab against a proximal

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mounting flange of the first slide rail to prevent sliding of the chassis and the front cover relative to the first and second slide rails; and positioning the first release lever into the second position comprises retracting the first engagement tab from the slot of the first slide rail to allow for sliding of the chassis and the front cover relative to the first and second slide rails.

21. The method of claim 19, comprising:

positioning the second cantilever extension into a third position to insert a second engagement tab of the second cantilever extension through a slot formed in the front cover to prevent pivoting of the front cover relative to the chassis into an open position; and

positioning the second cantilever extension into a fourth position to retract the second engagement tab from the slot of the front cover to allow for pivoting of the front cover relative to the chassis into the open position.

22. A cable enclosure system, comprising:

a rack including a first support structure and a second support structure; and

a cable enclosure mounted to the rack, the cable enclosure including:

a chassis;

a front cover coupled to the chassis;

a first slide rail and a second slide rail slidably coupled relative to the chassis, the first slide rail fixedly coupled to the first support structure of the rack and the second slide rail fixedly coupled to the second support structure of the rack; and

a first release lever mounted to the chassis, the first release lever is capable of being positioned into a first position and a second position; and

a rear cover and a front door coupled to the chassis; wherein in the first position, the first release lever engages the chassis to prevent sliding of the chassis and the front cover relative to the first and second slide rails; and

wherein in the second position, the first release lever disengages the chassis to allow for sliding of the chassis and the front cover relative to the first and second slide rails; and

wherein disengagement of the first release lever from the chassis allows for sliding of the chassis, the front cover, the rear cover, and the front door relative to the first and second slide rails.

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